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Structural Change, Productivity and Employment in the New EU Member States

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Executive summary

This paper provides an overview of longer-term structural developments in the new EU Member States from Central and Eastern Europe (NMS). It analyses structural changes in the NMS' economies and patterns of productivity catching-up both at macro level and within the individual industries. With the transformational recession of the early 1990s left behind, the majority of the NMS embarked on a path of rapid economic growth during the past decade. They have experienced an impressive productivity catching-up, both at the macroeconomic level and in the manufacturing industry in particular. Yet in most NMS the growth of labour productivity went hand in hand with declining employment, and even with considerable job losses in the manufacturing industry. The structural changes observed during the past decade brought the NMS' economies nearer to the economic structure observed in the EU-15, but the shifts of labour among individual sectors or industries themselves did not have any marked impact on aggregate productivity growth. Similar to the EU-15, the recent productivity catching-up observed in the NMS resulted overwhelmingly from across-the-board productivity improvements in individual sectors of the economy while employment shifts among sectors had only a negligible effect on aggregate productivity growth. Notwithstanding fast productivity catching-up, the estimated productivity levels indicate that NMS are in this respect still lagging considerably behind the EU-15 economies, implying a huge catching-up potential. The estimated elasticity of employment to production growth is low in all NMS; the recently observed and expected rates of economic growth will in all likelihood not be sufficient for the creation of additional jobs. The required further productivity convergence with the EU-15 may thus be in conflict with the urgently needed employment growth in the NMS; net job creation occurred in just a few services sectors and could not offset the job losses in agriculture and industry.

Keywords: *structural change, economic growth, productivity, employment, EU enlargement*

JEL classification: *E24, F43, J21, J60, O11, P52*

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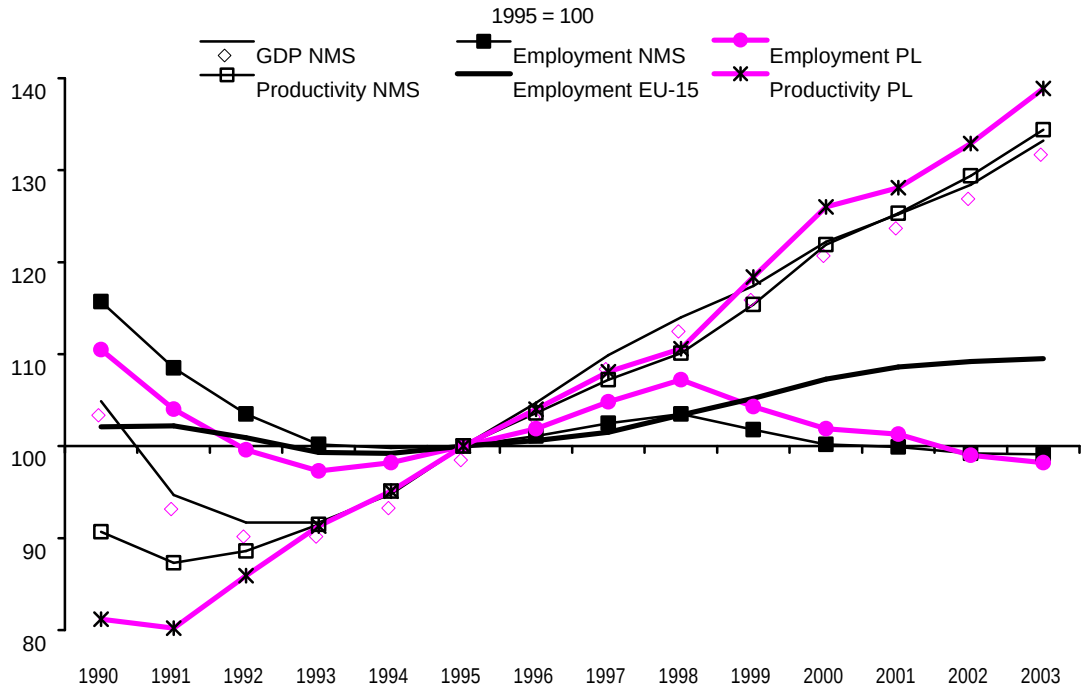
Structural change, productivity and employment in the new EU Member States

1 Development of GDP, employment and macro-productivity

In the first half of the 1990s, the Central and East European countries which have joined the EU on 1 May 2004 – the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia, in the following termed NMS-8 – went through the dramatic phase of the 'transitional recession': their GDP and employment recorded considerable declines (Figure 1), due to supply as well as demand shocks caused by the loss of traditional export markets, the disruption of existing supply chains and decision-making structures, sudden trade liberalization and restrictive macroeconomic policies. During 1990-1995, the NMS-8 experienced a cumulated decline of real GDP by 4.7%. This translated into a substantial *negative* growth differential ('falling behind') for the NMS-8 vis-à-vis the EU-15 (Table 1).

Figure 1

GDP, employment and productivity in the EU-15, NMS and Poland



Source: wiiw Database incorporating national statistics and AMECO, wiiw estimates (weighted averages).

From 1993/94 onwards (in Poland already in 1992), economic recovery gained momentum in the NMS-8 and their average growth began to exceed that of the EU-15. However, a closer look reveals that most of these countries experienced further – at times sharp –

interruptions in their growth processes due to delayed/failed corporate restructuring and occasional financial crises (often called 'secondary transformational recessions') and/or macroeconomic imbalances, sometimes caused by unsustainable current account or fiscal deficits. Also, the growth process became more differentiated across the region, with the two EU candidate countries Romania and Bulgaria significantly lagging behind. For the period 1995-2003, the average annual growth rate of GDP was 3.7% for the NMS-8.[1] GDP growth accelerated moderately after 1995 in the EU-15 as well, with an average annual growth rate of 2.3% over the period 1995-2003. The growth differentials thus turned in favour of the NMS and reached almost 16 percentage points in cumulative terms and 1.3 percentage points p.a. for the NMS-8. Taking into consideration the whole period 1990-2003, there was no difference in cumulative GDP growth for the NMS-8 relative to the EU-15 and therefore no catching-up (Table 1).

Employment in the NMS-8 declined even more strongly than GDP in the first years of transition (-13% between 1990 and 1995) and did not fully recover even thereafter (Table 1). For the whole period 1990-2003, the cumulated employment decline in the NMS-8 reached nearly 17% (almost 6 million jobs were lost) – again with notable differences across the region. In the more recent period for which comparable data are available (after 1995), declining employment in Poland has been the main contributor to the dismal labour market performance of the NMS as a group (Figure 1 and Landesmann et al., 2004). In the EU-15, overall employment declined in the first half of the 1990s as well, but to a much lesser extent than in the NMS. In the second half of the 1990s, EU-15 employment was growing moderately (1.1% annually), resulting in a cumulated increase in employment throughout the whole period 1990-2003 by 7.3%.

Turning now to aggregate developments of income and productivity, *macro-productivity* in the NMS-8 rose on average at a similar pace as in the EU-15 in the period 1990-1995 (Table 1).[2] But productivity gains in the NMS-8 during that period resulted mainly from massive labour shedding which overcompensated the fall in output. Thus, productivity gains reflected at that time the painful adjustment process going on in these countries rather than a successful restructuring and modernization of their economies. GDP *per capita*, as a common measure for living standards, declined substantially in particular in the first years of transition (see Figure 2).

[1] 3.2% if Bulgaria and Romania, which recorded average annual growth rates of 1.1%, were included.

[2] Macro-productivity is defined as GDP per employed person – employees and self-employed.

Table 1

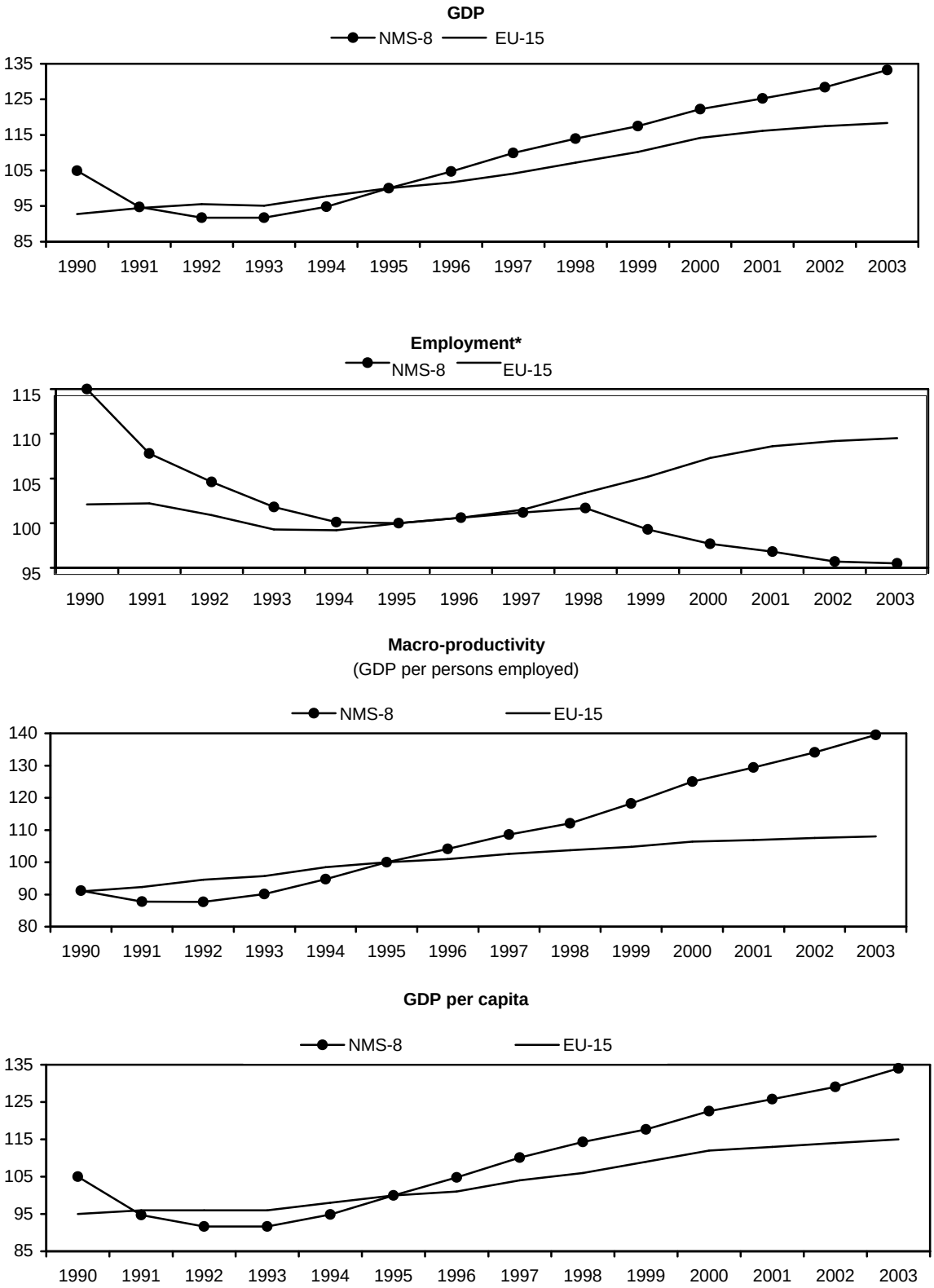
Long-term growth and productivity catching-up of NMS

Country groups	1990-1995				1995-2003				1990-2003			
	growth rate in %		growth differential against EU-15 in pp		growth rate in %		growth differential against EU-15 in pp		growth rate in %		growth differential against EU-15 in pp	
	cumu-lated	annual average	cumu-lated	annual average	cumu-lated	annual average	cumu-lated	annual average	cumu-lated	annual average	cumu-lated	annual average
NMS-8[1)]												
GDP	-4.7	-1.0	-12.5	-2.5	33.2	3.7	15.9	1.3	27.0	1.9	0.5	-0.1
Employment	-13.0	-2.7	-11.0	-2.3	-4.5	-0.6	-13.9	-1.7	-16.9	-1.4	-24.2	-2.0
Macro-productivity	9.6	1.9	-0.5	-0.1	39.5	4.3	32.0	3.4	52.8	3.3	33.9	2.0
Cyprus												
GDP	25.5	4.7	17.7	3.1	29.9	3.3	12.6	1.0	63.1	3.8	36.5	1.9
Employment	10.8	2.1	12.9	2.5	9.9	1.2	0.4	0.1	21.8	1.5	14.6	1.0
Macro-productivity	13.2	2.5	3.2	0.6	18.2	2.1	10.8	1.2	33.9	2.3	15.0	0.9
Malta												
GDP	22.8 [2)]	5.3 [2)]	22.8 [2)]	5.3 [2)]	26.0	2.9	8.7	0.6	54.8 [3)]	4.1 [3)]	54.8 [3)]	4.1 [3)]
Employment	7.9	1.5	10.0	1.9	3.8	0.5	-5.7	-0.7	12.0	0.9	4.7	0.3
Macro productivity	16.0 [2)]	3.8 [2)]	16.0 [2)]	3.8 [2)]	21.5	2.5	14.0	1.6	40.9 [3)]	3.2 [3)]	40.9 [3)]	3.2 [3)]
NMS-8+BG and RO												
GDP	-6.3	-1.3	-14.1	-2.8	28.6	3.2	11.3	0.9	20.5	1.4	-6.1	-0.5
Employment	-13.0	-2.8	-10.7	-2.3	-6.1	-0.8	-15.6	-1.9	-18.4	-1.5	-25.6	-2.1
Macro productivity	7.7	1.5	-2.4	-0.4	37.0	4.0	29.6	3.1	47.6	3.0	28.7	1.7
EU-15												
GDP	7.8	1.5	-	-	17.4	2.3	-	-	26.6	2.0	-	-
Employment	-2.0	-0.4	-	-	9.5	1.1	-	-	7.3	0.5	-	-
Macro productivity	10.1	1.9	-	-	7.5	0.9	-	-	18.9	1.3	-	-

Notes: 1) NMS-8: Central and East European new EU Member States, comprising the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia. - 2) 1991-1995. - 3) 1991-2003.

Sources: wiiw Database incorporating national statistics; wiiw calculations using AMECO.

Figure 2 **GDP, employment and macro-productivity in the NMS and EU-15 (1995 = 100)**



* employees and self-employed

Source: wiiw Database incorporating national statistics; wiiw calculations using AMECO.

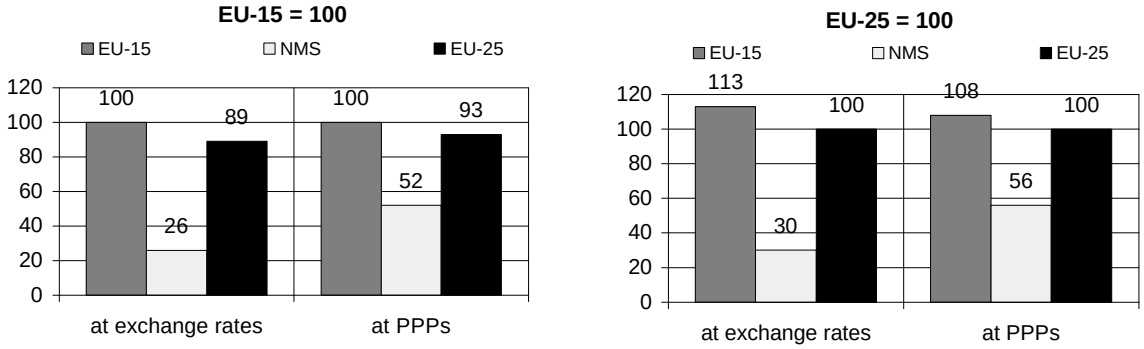
In the second half of the 1990s, the rise of macro-productivity strongly accelerated in the NMS-8 and this time productivity growth was supported by fast rising GDP at relatively constant employment levels in most NMS (Poland being the main exception). During 1995-2003, productivity growth was significantly higher in the NMS-8 than in the EU-15 (4.3% per annum as compared to 1% in the EU-15). The process of the impressive 'productivity catching-up' of the NMS after 1995 is clearly demonstrated in Figure 2. The cumulated 'productivity gain' of the NMS-8 vis-à-vis the EU-15 over the whole period 1990-2003 reached nearly 34 percentage points, almost all of which was achieved after 1995 (Table 1).

Figure 3

Levels of macro-productivity and of GDP per capita in the NMS, EU-15 and EU-25, year 2003

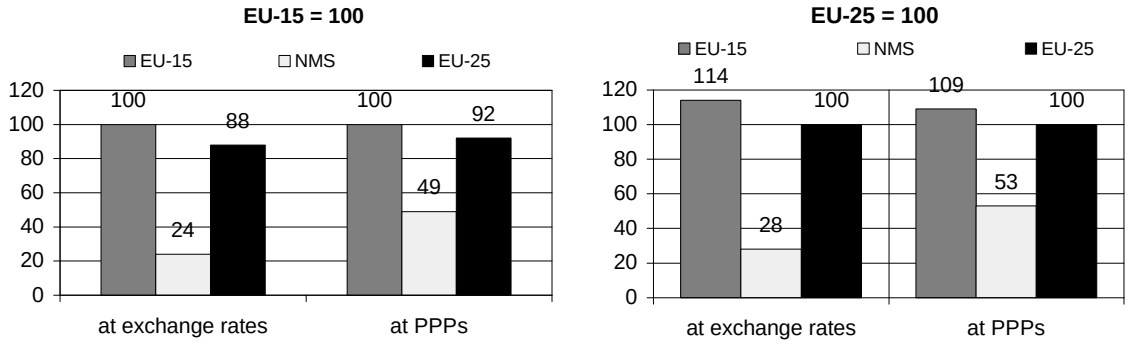
Macro-productivity

(GDP per person employed*)



*) employees and self-employed; PPPs = purchasing power parities.

GDP per capita



Note: NMS include Cyprus and Malta.

Source: wiiw calculations using national statistics and AMECO Database.

Despite the remarkable productivity catching-up in the recent period, the level of macro-productivity in the NMS is still very low compared to the EU-15 average, leaving ample space for further productivity growth and catching-up. In the year 2003, the average level

of macro-productivity (compared at current exchange rates) for all ten first-round NMS (including Cyprus and Malta) taken together was only 26% of the average EU-15 level. Measured at purchasing power parities (PPPs), which correct for undervalued currencies still prevailing in many NMS, the average level of macro-productivity reached just 52% of the EU-15 average (56% if compared to the enlarged EU-25; see Figure 3).[3]

2 Changes in broad sectoral structures

Economic developments in the NMS during the transition period were characterized by large shifts in the sectoral composition of GDP and employment, indicating a clear tendency of adjustment towards the broad economic structures in the EU-15. In 1990 the NMS started off with a larger agricultural and industrial sector than the EU-15 countries, on the one hand, and a smaller services sector, on the other (see Figures 4 and 5).[4] The broad shifts occurring in the NMS after 1990 may thus be summarized under the headings of *de-agrarianization, de-industrialization and tertiarization*. However, there are a few interesting cases of 're-agrarianization' and 're-industrialization' as well. But while the former are considered to be of a transitory nature, the latter may become a more common phenomenon in the future.

An overall tendency for de-agrarianization, de-industrialization and tertiarization can be observed in the EU-15 throughout this period as well, but here it has been much less pronounced than in the NMS. There has also been one example of *re-industrialization* within the EU-15, namely that of Ireland, where the share of industrial value added in GDP increased from 32% in 1990 to 37% in 2001 – yet employment shares remained constant (European Commission, 2003).

De- and re-agrarianization

In all NMS-8, the shares of agriculture in GDP *and* employment fell dramatically during the 1990s ('de-agrarianization').[5] Employment declined significantly in absolute terms as well.

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[3] However, for the more advanced NMS such as Cyprus, Malta and Slovenia, macro-productivity measured at exchange rates has already reached between 50% and 60% of the EU-15 level and between 70% and 80% if PPPs were used for conversion. Due to lower employment rates in some of the Central and East European countries, GDP per capita for the NMS reached only 24% (at exchange rates) and 47% (at PPPs) of the EU-15 level.

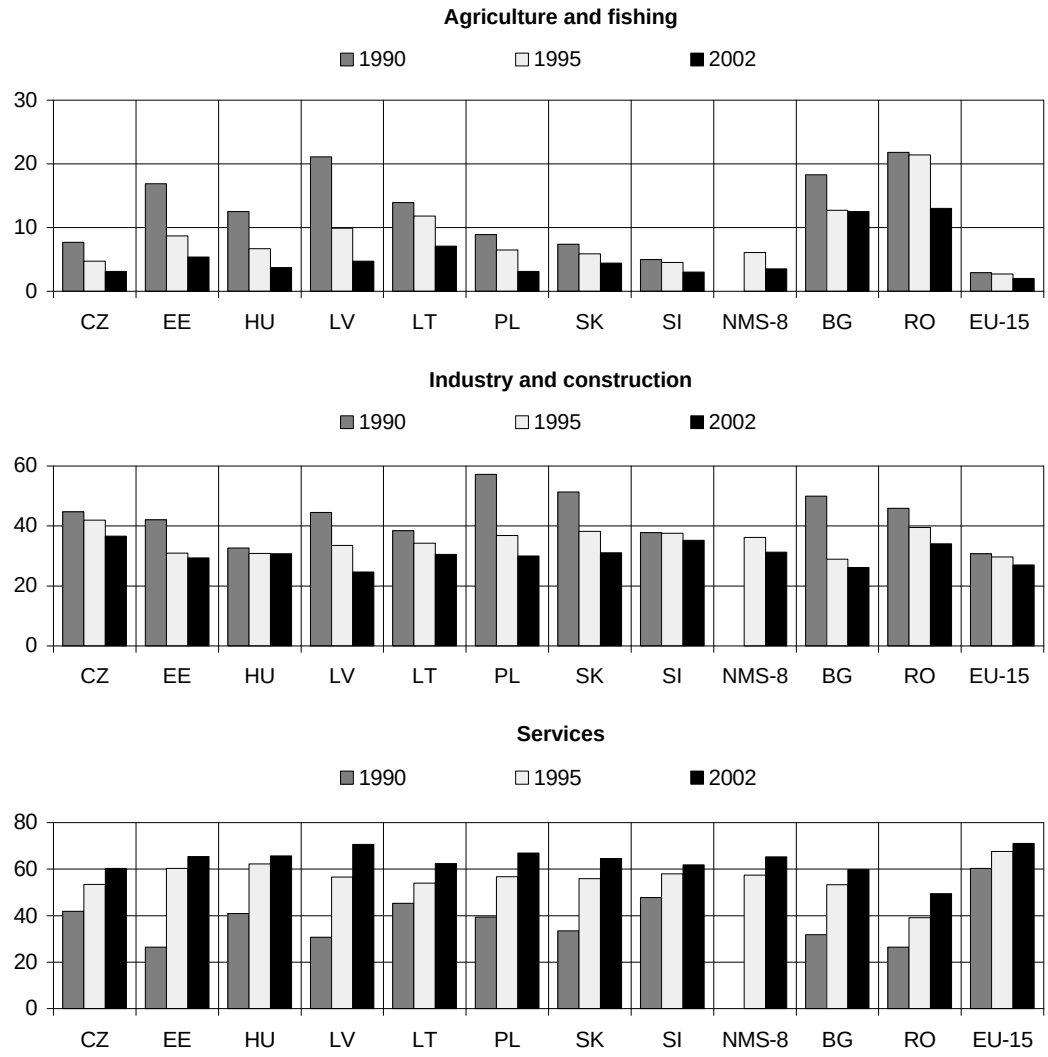
[4] Under the previous regime, industry was emphasized at the expense of services and, furthermore, service activities were often supplied within big industrial combines, which meant that they were classified under 'industry' and to some extent 'agriculture' as well. Most services were considered 'unproductive labour' and their contribution to the efficient functioning of the economy was neglected (Stare and Zupancic, 2000). Also, many modern services that play an important role in market economies (such as marketing, financial services, real estate and other business services) were simply not needed under socialism (Soubbotina and Sheram, 2000).

[5] Sector shares in this section are defined as gross value added (GVA) of agriculture (industry, services) in gross domestic product (GDP). Because of the so-called 'Financial intermediation services indirectly measured' (FISIM), which are included in GDP but not in gross value added, the so defined shares of the three sectors will not add up exactly to 100 %.

Figure 4

Comparison of NMS and EU-15 gross value added structures in 1990, 1995 and 2002

% of GVA



Note: GVA = gross value added.

Sources: wiiw Database incorporating national statistics; wiiw calculations using AMECO.

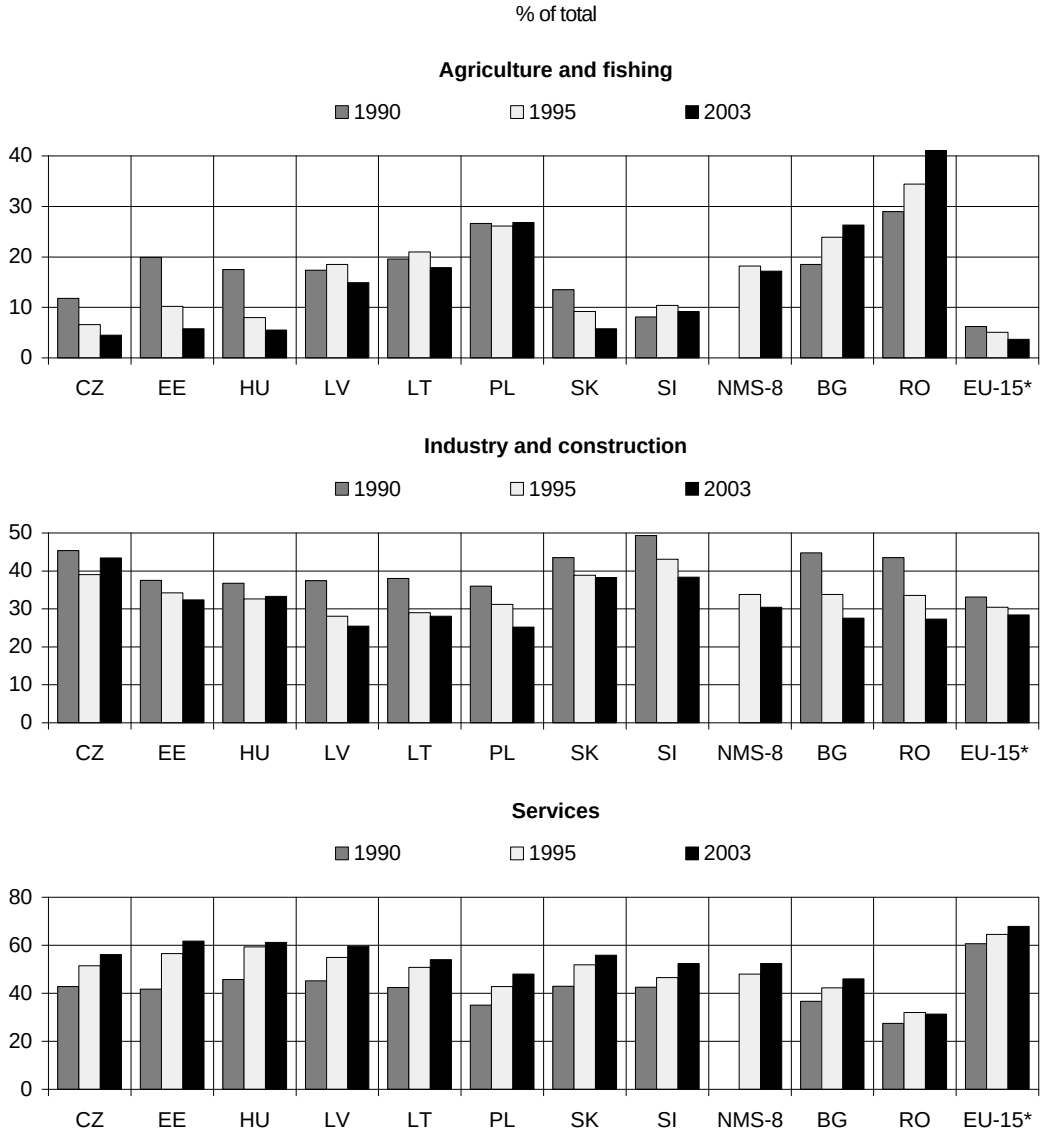
Despite massive de-agrarianization in the NMS-8, the shares of agriculture in GDP and employment of these countries is on average still higher than in the EU.[6] In the more advanced NMS such as the Czech Republic, Hungary and Slovenia, the difference to the EU-15 was minimal in the share of gross value added (GVA), though not in terms of employment shares. In general, the differences between GVA shares and employment shares in agriculture are larger in the NMS than in the EU-15, due to the relatively low

[6] In Bulgaria and Romania the share of employment in agriculture has been very high (25% and almost 40%, respectively). This results from the severe employment crises in both countries due to the dramatic decline in industrial employment and the so far limited absorption capacity of the services sectors.

productivity in NMS' agriculture as compared to the other sectors of the economy. With competitive pressures rising and modernization in agriculture accelerating after accession, we may thus expect agricultural employment in the new EU member countries to fall. This is particularly relevant for Poland, some of the Baltic countries and for the candidate countries Bulgaria and Romania, where the differences between GVA shares and employment shares in agriculture are huge (compare Figures 4 and 5), and productivity levels particularly low (Figure 6b).

Figure 5

Comparison of NMS and EU-15 employment structures in 1990, 1995 and 2003



*) Year 2002

Sources: wiiw Database incorporating national statistics; wiiw calculations using AMECO.

De- and reindustrialization

The share of industry (comprising manufacturing, mining, water & electricity supply and construction) declined strongly in terms of both GVA and employment in most NMS. This decline was more pronounced in the first years of transition and levelled off after 1995. Yet industrial employment dropped sharply in absolute terms even after 1995 (by nearly 1.3 million persons, over half of them in Poland). However, by around 1998/1999, labour shedding in industry bottomed out and employment started to rise slightly in some NMS (e.g. in Hungary, the Czech Republic and Slovakia; Poland is again an exception). On average, the shares of industry and construction in both GVA and employment in NMS still tend to be somewhat higher than in the EU-15 on average (30% and 27%), with some countries having particularly high employment shares of industry (e.g. Czech Republic, Slovakia, Slovenia – see Figure 5).[7]

As illustrated by the recent example of Hungary and the Czech Republic, there is a possibility for a few additional NMS (e.g. Slovakia) to experience some kind of re-industrialization in the future. Low labour costs and the pool of skilled labour make the NMS an attractive location for FDI in export-oriented manufacturing productions and, as illustrated by many Southeast Asian economies, strong export orientation may well lead to a higher share of industry in both GDP and employment than would be typical of a certain stage of economic development. However, whether this process will result in the creation of a substantial number of additional jobs is not certain (see below). [8]

Tertiarization

The *share of services,* in both GVA and employment, has increased significantly in most NMS during the past decade, indicating a clear 'catching-up' of this sector. However, at the beginning of transition, the rise of GVA and employment shares was mainly of a 'passive nature', reflecting a less pronounced decline of employment in services than in industry and agriculture. Only when growth of the overall economy gained momentum, employment in services started to rise in absolute terms as well: between 1995 and 2003 nearly 1 million of services jobs were created in the NMS-8. Despite rapid expansion, the shares of services in GVA and especially in employment in the NMS are still distinctly lower than in the EU-15.[9] Moreover, in all NMS the gap vis-à-vis the EU-15 is largest in the field of financial and other business services (marketing, consulting, auditing etc.). Within the services sector, employment gains were due to job creation in the market services segment (particularly in trade, tourism and real estate – see Landesmann et al, 2004). The

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[7] Figure 4 uses GVA data at current prices. The available evidence from selected NMS suggests that changes in relative prices did not affect the respective GVA shares to a large extent.

[8] Urban (2001), Landesmann et al (2004) and Stehrer (2004) for more details and development scenarios.

[9] Services shares are particularly low in the second-round accession countries, Bulgaria and Romania.

services sector thus may become the major provider of new employment. But again, whether this process will lead to the creation of additional jobs is not certain. Parts of the services sector, in particular financial services and retail trade, currently experience a restructuring process (as witnessed by industry earlier), which is associated with considerable efficiency improvements and layoffs of redundant workers.[10]

3 Structural change and productivity growth

In this chapter we examine the effects of recent structural changes on the growth of labour productivity in the NMS. The traditional assumption of the growth accounting literature is that structural change is an important source of growth and overall productivity improvements. The standard hypothesis assumes a surplus of labour in some (less productive) parts of the economy (such as agriculture), thus shifts towards higher-productivity sectors (industry) are beneficial for aggregate productivity growth. Even within industry, shifts towards more productive branches should boost aggregate productivity. On the other hand, structural change may have a negative impact on aggregate productivity growth if labour shifts to industries with slower productivity growth. The 'structural bonus and burden' hypotheses were examined by the example of Asian economies by Timmer and Szirmai (2000), a large sample of OECD and developing countries (Fagerberg, 2000), and more recently by Peneder and DG Employment for the USA, Japan and EU Member States (Peneder, 2002, European Commission, 2003b). None of these studies has covered transition economies from Central and Eastern Europe.

The overall developments regarding output, employment and productivity described above mask substantial structural changes within NMS economies and their individual sectors. Structural changes reflect *inter alia* different speeds of restructuring and resulting efficiency gains or losses at branch level. The impact of structural change on aggregate productivity growth in NMS will be evaluated by the frequently applied shift-share analysis in analogy with Timmer and Szirmai (2000), Fagerberg (2000), Peneder (2002) and others. The shift-share analysis provides a convenient tool for investigating how aggregate growth is linked to differential growth of labour productivity at the sectoral level and to the reallocation of labour between industries. It is particularly useful for the analysis of productivity developments in NMS where data limitations prevent us from using more sophisticated econometric approaches (see Box 1). [11]

[10] The evidence for productivity gains in NMS' services sectors has been mixed so far. Moreover, a proper assessment is plagued by numerous conceptual and statistical problems (Wölfl, 2004). Rough estimates of labour productivity growth in services are provided in Chapter 4 below.

[11] Even this kind of analysis encounters a number of serious statistical problems. The majority of NMS do not publish sectoral value added data at constant prices. Owing to the lack of sector-specific price indexes we have applied GDP price deflators to calculate series at constant prices. Moreover, the measurement of output in certain services sectors is particularly problematic (Wölfl, 2004).

Box 1 **Decomposition of aggregate labour productivity growth**

Using the same notation as presented in Peneder (2002), we decompose the aggregate growth of labour productivity into three separate effects:

$$growth(LP_T) = \frac{LP_{T,fy} - LP_{T,by}}{LP_{T,by}} = \frac{\overbrace{\sum_{i=l}^{n} LP_{i,by}(S_{i,fy} - S_{i,by})}^{I:static\ shift\ effect} + \overbrace{\sum_{i=l}^{n} (LP_{i,fy} - LP_{i,by})(S_{i,fy} - S_{i,by})}^{II:dynamic\ shift\ effect} + \overbrace{\sum_{i=l}^{n} (LP_{i,fy} - LP_{i,by})S_{i,by}}^{III:within\ growth\ effect}}{LP_{T,by}} \quad (1)$$

where LP=labour productivity; by=base year, fy=final year; T=S over industries i; S_i=share of industry i in total employment.

First, the structural component is calculated as the sum of relative changes in the allocation of labour across industries between the final year and the base year, weighted by the value of the sector's labour productivity in the base year. This component is called the *static shift* effect. It is positive/negative if industries with high levels of productivity (and usually also high capital intensity) attract more/less labour resources and hence increase/decrease their share of total employment. The standard *structural bonus* hypothesis of industrial growth postulates a positive relationship between structural change and economic growth as economies are upgrading from low- to higher-productivity industries. The *structural bonus* hypothesis thus corresponds to an expected positive contribution of the static shift effect to aggregate growth of labour productivity:
The *structural bonus* hypothesis:

$$\sum_{i=l}^{n} LP_{i,by}\,(S_{i,fy} - S_{i,by}) > 0 \quad (2)$$

Second, *dynamic shift* effects are captured by the sum of interactions of changes in employment shares and changes in labour productivity of individual sectors/industries. If industries increase both labour productivity and their share of total employment, the combined effect is a positive contribution to overall productivity growth. In other words, the interaction term becomes larger, the more labour resources move toward industries with fast productivity growth. The interaction effect is, however, negative if industries with fast growing labour productivity cannot maintain their shares in total employment. Thus, the interaction term can be used to evaluate Baumol's hypothesis of a *structural burden* of labour reallocation which predicts that employment shares shift away from progressive industries towards those with lower growth of labour productivity (Baumol, 1967). We would expect to confirm the validity of the *structural burden* hypothesis in the NMS due to the above-sketched shifts from industry to services (with lower productivity levels) at the macro level, and due to shifts from heavy (and capital-intensive) to light industries within manufacturing, respectively.
The *structural burden* hypothesis:

$$\sum_{i=l}^{n} (LP_{i,fy} - LP_{i,by})(S_{i,fy} - S_{i,by}) < 0 \quad (3)$$

Third, the *'within-growth'* effect corresponds to growth in aggregate labour productivity under the assumption that no structural shifts in labour have ever taken place and each industry (sector) has maintained the same share in total employment as in the base year. We must, however, recall that the frequently observed near equivalence of the within-growth effect and aggregate productivity growth cannot be used as evidence against differential growth between industries. Even in case all positive and negative structural effects net out, much variation in productivity growth can be present at the more detailed level of activities.[12]

[12] As productivity has a robust tendency to grow, the within-growth effect is practically a summation over positive contributions only. Conversely, for each industry the sign of the contribution to both shift effects depends on whether labour shares have increased or decreased. The shift effects therefore capture only that comparatively small increment to aggregate growth which is generated by the net difference in productivity performance of the shifting share of the labour resources. Even that increment can either be positive (structural bonus) or negative (structural burden). In short, offsetting effects of shifts in employment shares of industries with high and low levels of labour productivity, as well as high and low productivity increases, explain why shift-share analyses regularly fail to reveal substantial direct contributions of structural change to aggregate growth.

Table 2 shows a decomposition of productivity growth in NMS (as well as in Bulgaria and Romania) at both the macro level (total gross value added) and in the manufacturing industry for the period 1995-2002. As far as the economy as a whole is concerned, the structural bonus hypothesis is mostly confirmed, though the contribution of labour shifts from low to high productivity growth sectors to aggregate productivity growth was in most cases rather small, in Romania and Latvia even negative. Keeping in mind the above-mentioned data caveats regarding productivity measurement in the services sector, a detailed inspection of the sectoral productivity performance gives a widely heterogeneous picture.[13] In most NMS, agriculture, construction, hotels and restaurants, as well as health and social work sectors recorded below-average labour productivity growth (Figure 6a). On the other hand, data would suggest positive contributions of trade, real estate and other (community and social services) activities to aggregate productivity growth.

Dynamic shift effects play an even smaller role as far as the contribution to aggregate productivity growth is concerned; a structural burden (a small negative dynamic shift effect) was detected only in Slovenia and Romania. The overwhelming part (more than 80%) of aggregate productivity growth in NMS during the period 1995-2002 can be attributed to *productivity growth within individual economic sectors*. This is broadly in line with productivity developments observed in advanced market economies,[14] but still somewhat surprising given the major restructuring that had occurred in NMS in that period. Obviously, aggregate productivity growth in NMS has mostly resulted from productivity improvements within individual sectors and their across-the-board productivity catching-up. In this respect, NMS economies display similarities with the more advanced EU-15 Member States (Peneder, 2002, European Commission, 2003b) yet their overall productivity growth has been impressive.

The data presented in the second part of Table 2 reveal that structural features of productivity growth in manufacturing industry were only marginally different. The evidence for individual NMS is mixed again, but a structural bonus (positive static shift effect) was detected for all NMS except the Czech Republic, Hungary, Estonia, Bulgaria and Romania. The negative static shift effect present in these countries means that labour moved away from (initially) high productivity manufacturing branches. As a rule, this effect resulted largely from labour shifts away from high labour productivity level industries (which are usually more capital-intensive and use more intermediate inputs) like coke and refined petroleum, chemicals and basic metals branches.[15] The structural burden hypothesis – a

[13] The measurement of output (and productivity) in services sector – especially in trade, real estate and financial intermediation poses serious problems – see O'Mahony and van Ark (2003), Wölfl (2004).

[14] Peneder (2002) and European Commission (2003b) have found similar results for EU-15 countries and the USA in the period 1995-1999.

[15] Note that due to limited data availability we use gross production as a measure of output. The negative static shift effect was particularly large in Bulgaria and Romania.

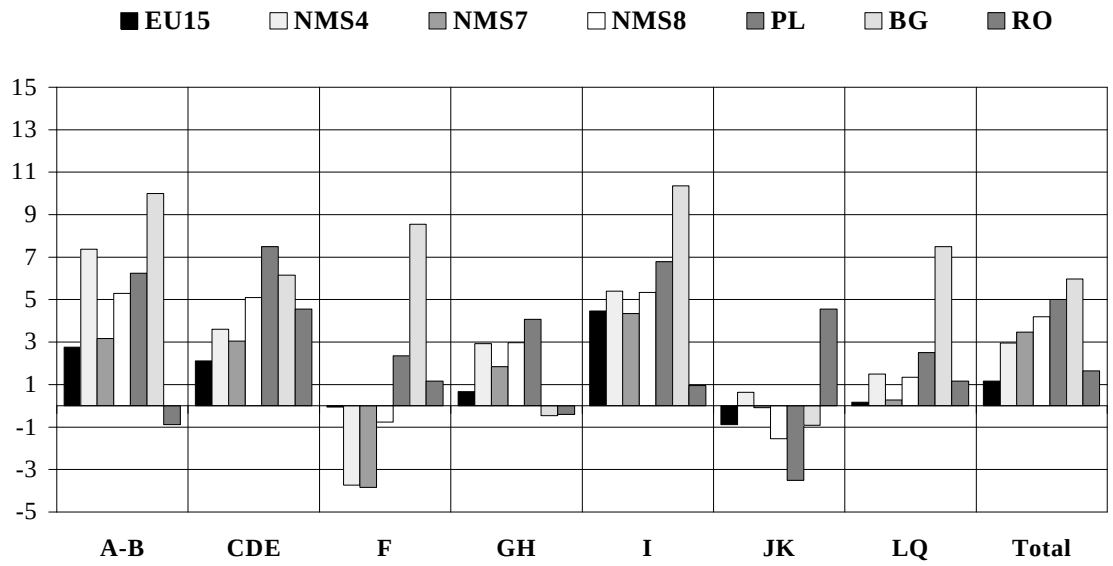
negative dynamic shift effect – could be confirmed for nearly all NMS. The only exception is Hungary (and, to a lesser degree, also Poland and Slovakia) where dynamic shifts were dominated by simultaneous productivity improvements and growing employment shares in just a few branches (usually in electrical, optical equipment and transport equipment). Nevertheless, the aggregate productivity growth in NMS' manufacturing was again dominated by productivity improvements within individual manufacturing branches.[16] Havlik (2003a) and Hunya (2002) provide some evidence for the key role played by foreign direct investment in productivity improvements and restructuring of NMS' manufacturing. Van Ark and Piatkowski (2004) show that the main contribution to productivity growth in selected NMS (the Czech Republic, Hungary, Poland and Slovakia) during 1993-2001 came from ICT-using manufacturing and non-ICT manufacturing. As opposed to the EU-15 and the USA, the contribution of ICT-producing branches to aggregate productivity growth was much lower (with the exception of Hungary).

A decomposition of productivity growth in the NMS' manufacturing industry thus again shows characteristics similar to those observed for the EU-15 countries. For these countries, Peneder (2002) found only a weak evidence for the reallocation of labour towards high productivity branches (at 3-digit NACE level) and could not confirm the structural bonus hypothesis even for a longer time period (1985-1998). Similar findings were obtained earlier by Timmer and Szirmai (2000) for a small sample of Asian economies, as well as by Faberberg (2000) for a number of OECD and developing countries. In this respect, we may conclude that the recent industrial restructuring in NMS did not differ too much from the earlier experience of other countries since shifts of labour among individual (2 digit NACE) industries apparently did not play a major role in total productivity improvements. There is some evidence of a structural burden effect in NMS' manufacturing since employment shifts towards slower productivity growth industries had, on average, slightly negative impact on aggregate productivity growth in manufacturing. The overwhelming part of overall manufacturing productivity growth in NMS can be attributed to *productivity improvements taking place in nearly all manufacturing industry branches (albeit at widely different rates – see Chapter 4)* – a process stimulated particularly by effects of FDI. In several NMS (especially in Hungary, Poland, Slovakia and Estonia), manufacturing labour productivity has recently expanded even faster than it did in the 'Asian Tigers' countries during their rapid catching-up period.

[16] Exemptions from a general tendency of productivity growth were in most cases only food, beverages, textiles and leather branches – see Table 7 below.

Figure 6a

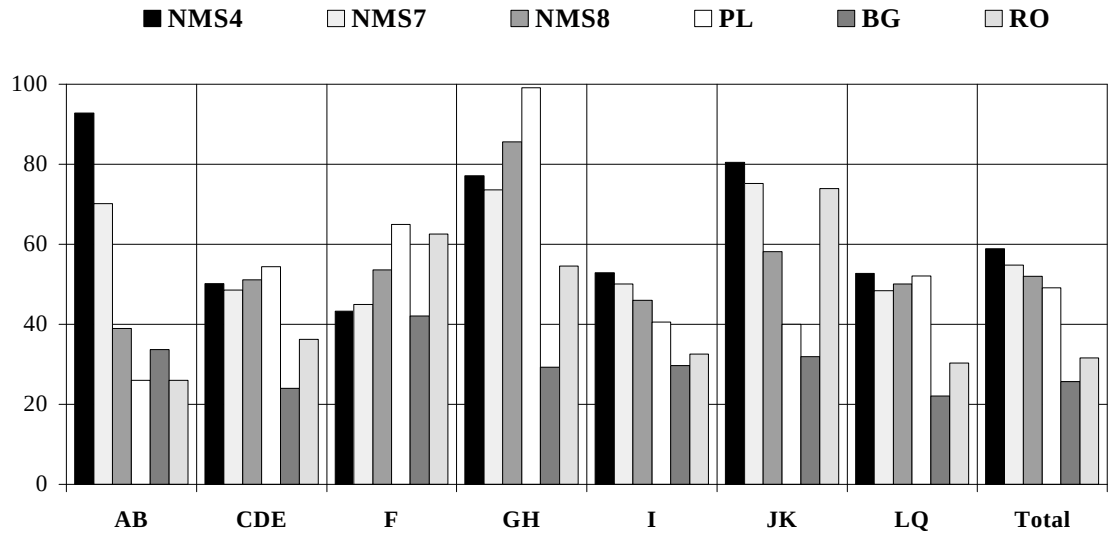
Productivity growth in NMS and EU-15 by economic sectors, 1995-2002
(annual averages, gross value added per employed person)



Source: wiiw calculations based on wiiw Database and OECD STAN Database.

Figure 6b

Productivity levels in NMS economic sectors, 2002
(gross value added per employed person, at PPP, EU-15 =100)



NACE sectors: AB: Agriculture, forestry and fishing; CDE: Mining, quarrying, manufacturing, electricity, gas and water supply; F: Construction; GH: Wholesale, retail trade; Hotels and restaurants; I: Transport, storage and communications; JK: Financial intermediation; Real estate, renting and business activities; L: Public administration and defence; Education; Health and social work; Other activities.

Source: wiiw calculations based on wiiw Database and OECD STAN Database.

Table 2

Decomposition of aggregate and manufacturing productivity growth in NMS (shift-share analysis), 1995-2002

Percentage of total labour productivity growth explained by:

		static shift effect LPby*(Sfy-Sby)/LPby	dynamic shift effect (LPfy-LPby)*(Sfy-Sby)/LPby	within growth effect (LPfy-LPby)*Sby/LPby	Total productivity effect	growth in % p.a.
Bulgaria, gross value added (without FISIM)	1996-2000	10.2	9.4	80.4	100.0	9.1
Bulgaria, manufacturing output	1995-2002	-37.0	-104.9	41.9	100.0	-1.1
Czech Republic, gross value added (without FISIM)	1995-2002	3.3	1.0	95.7	100.0	7.9
Czech Republic, manufacturing output	1995-2002	-1.4	-25.6	127.0	100.0	4.0
Hungary, gross value added (without FISIM)	1995-2001	8.2	3.1	88.7	100.0	10.0
Hungary, manufacturing output	1995-2002	-5.9	24.8	81.1	100.0	8.0
Poland, gross value added (without FISIM)	1995-2000	3.8	2.3	93.8	100.0	11.3
Poland, manufacturing output	1995-2002	5.4	2.8	91.8	100.0	9.3
Slovak Republic, gross value added (without FISIM)	1995-2002	5.9	1.6	92.4	100.0	7.2
Slovak Republic, manufacturing output	1995-2002	0.8	0.9	98.3	100.0	8.0
Slovenia, gross value added (without FISIM)	1995-2002	3.3	-2.9	99.7	100.0	7.5
Slovenia, manufacturing output	1995-2002	9.7	-5.0	95.3	100.0	3.0
Romania, gross value added (without FISIM)	1995-2001	-8.7	-9.4	118.0	100.0	8.0
Romania, manufacturing output	1995-2002	-15.9	-18.3	134.2	100.0	5.3
Estonia, gross value added (without FISIM)	1995-2002	4.6	0.0	95.4	100.0	10.4
Estonia, manufacturing output	1995-2001	-7.7	-3.5	111.2	100.0	10.3
Latvia, gross value added (without FISIM)	1995-2001	-0.4	6.1	94.2	100.0	9.9
Latvia, manufacturing output	1995-2001	13.4	-4.3	90.8	100.0	7.5
Lithuania, gross value added (without FISIM)	1997-2001	2.3	0.3	97.4	100.0	5.0
Lithuania, manufacturing output	1995-2001	13.8	-7.4	93.6	100.0	7.0

Notes: Aggregate productivity based on gross value added at constant prices (without FISIM) and employment according to LFS statistics:
Bulgaria: 12 NACE 1-digit sectors (1996-2000), Czech Republic: 8 sectors (1995-2002), Hungary and Poland: 12 sectors (1995-2001, resp. 2000), Slovak Republic:12 sectors (1995-2002), Slovenia: 12 sectors (1995-2002), Romania: 12 sectors (1995-2001), Estonia: 12 sectors (1995-2002), Latvia: 12 sectors (1995-2001), Lithuania: 12 sectors (1997-2001).
FISIM: Financial intermediation services indirectly measured.
Manufacturing labour productivity based on gross output at constant prices and employment for 14 NACE 2-digit manufacturing sectors.

Sources: Countries in Transition 2003. wiiw Handbook of Statistics, wiiw, Vienna, 2003; wiiw Industrial Database.

4 Patterns of productivity catching-up in manufacturing

This chapter looks in more detail at patterns of structural convergence of NMS' manufacturing industry and evaluates the impact of structural changes on manufacturing industry labour productivity growth. Manufacturing industry provides 21% of all jobs in NMS-8 – slightly more than in EU-15 (19.4%). However, the output of the sector, compared to aggregate production in the EU-15, is relatively small. Taken together, manufacturing production of all NMS-8 made up less than 5% of the total manufacturing output in the enlarged EU-25 in 2002. However, in view of the still grossly undervalued currencies, the 'real' shares of NMS' manufacturing are higher – around 9% of the total EU-25 manufacturing, and in some industries such as wood products, non-metallic minerals, rubber and plastics, food & beverages and manufacturing n.e.c. (mainly furniture) even more than that – see Table 3. As far as employment is concerned, NMS-8 account for nearly 15% of EU-25 manufacturing jobs, with particularly high employment shares in the food and beverages, textiles, wood, coke and refinery industries.

Large differences between production and employment shares point at substantial productivity gaps between the NMS and EU-15 Member States. On average, NMS' manufacturing labour productivity was below 30% of EU-15 level in 2002, respectively about 55% of that level if output values were converted with PPPs (with huge differences among individual NMS – see Table A1 in Appendix). A crucial issue in the context of EU cohesion and NMS' future productivity catching-up is whether (and in what manner) these gaps will be narrowed in future. Will NMS' production shares in an enlarged EU-25 increase or, rather, will their employment shares decline? What will be the speed of these adjustments and how they will differ across individual countries and industries?[17] These and other questions will be addressed below.

[17] The closure of NMS productivity gap in ten years (i.e. the equalization of their production and employment shares in EU-25) would require annual output growth differential of about 7 percentage points above EU-15 (in 15 years about 5pp).

Table 3

Size of European manufacturing industry after enlargement to EU-25

	Production (gross output)	EU-15 mn euro ER	NMS-8 mn euro ER	NMS-10 mn euro ER	NMS-8 share in EU-15+NMS-8 in %	NMS-10 share in EU-15+NMS-10 in %	NMS-8 mn euro PPP	NMS-10 mn euro PPP	NMS-8 share in EU-15+NMS-8 in %	NMS-10 share in EU-15+NMS-10 in %
DA	Food products; beverages and tobacco	733140	49830	57811.7	6.4	7.3	97150	120305	11.7	14.1
DB	Textiles and textile products	185311	10811	13816.6	5.5	6.9	21270.5	29997.6	10.3	13.9
DC	Leather and leather products	44161	1951	2608.77	4.2	5.6	3780.05	5680.11	7.9	11.4
DD	Wood and wood products	95875	7925	9083.18	7.6	8.7	15546.1	18892.1	14.0	16.5
DE	Pulp, paper & paper products; publishing & printing	368940	15347	16526.7	4.0	4.3	29822.9	33255.5	7.5	8.3
DF	Coke, refined petroleum products & nuclear fuel	286324	11776	17573.3	4.0	5.8	23849.2	40680.9	7.7	12.4
DG	Chemicals, chemical products and man-made fibres	523133	17402	20593.1	3.2	3.8	33646	42915.6	6.0	7.6
DH	Rubber and plastic products	194917	12496	13422.7	6.0	6.4	24508.9	27192.7	11.2	12.2
DI	Other non-metallic mineral products	172137	12341	13966.7	6.7	7.5	24333.7	29055.1	12.4	14.4
DJ	Basic metals and fabricated metal products	544310	27668	34964.8	4.8	6.0	54788.2	75766.3	9.1	12.2
DK	Machinery and equipment n.e.c.	455251	15246	17164.5	3.2	3.6	29653.9	35255	6.1	7.2
DL	Electrical and optical equipment	521531	32046	33694.5	5.8	6.1	62889	67690.5	10.8	11.5
DM	Transport equipment	648537	29943	31891	4.4	4.7	59799.8	65400.7	8.4	9.2
DN	Manufacturing n.e.c.	159981	10071	11346.7	5.9	6.6	19623.6	23311.2	10.9	12.7
D	**Total manufacturing**	**4933548**	**255107**	**295290**	**4.9**	**5.6**	**501208**	**617674**	**9.2**	**11.1**

(Table 3 contd.)

Table 3 (contd.)

	Employment	EU-15	NMS-8 Employment Persons	NMS-10	NMS-8 share in EU-25 in %	NMS-10 share in EU-25 in %
DA	Food products; beverages and tobacco	3334941	852725	1120149	19.1	25.1
DB	Textiles and textile products	1830973	616503	1129615	20.8	38.2
DC	Leather and leather products	439091	102660	215750	15.7	32.9
DD	Wood and wood products	867178	247515	332626	20.6	27.7
DE	Pulp, paper & paper products; publishing & printing	2247610	254647	316535	9.9	12.3
DF	Coke, refined petroleum products & nuclear fuel	143964	39993	67395	18.9	31.9
DG	Chemicals, chemical products and man-made fibres	1680304	211925	304462	10.7	15.3
DH	Rubber and plastic products	1399070	241698	288085	14.3	17.1
DI	Other non-metallic mineral products	1227139	280430	376902	17.5	23.5
DJ	Basic metals and fabricated metal products	4053299	611413	811614	12.6	16.7
DK	Machinery and equipment n.e.c.	3060086	457280	679519	12.2	18.2
DL	Electrical and optical equipment	3113466	530074	640669	14.1	17.1
DM	Transport equipment	2618727	350446	487267	11.3	15.7
DN	Manufacturing n.e.c.	1494355	304523	418644	15.9	21.9
D	**Total manufacturing**	**27510203**	**5106698**	**7194098**	**14.7**	**20.7**

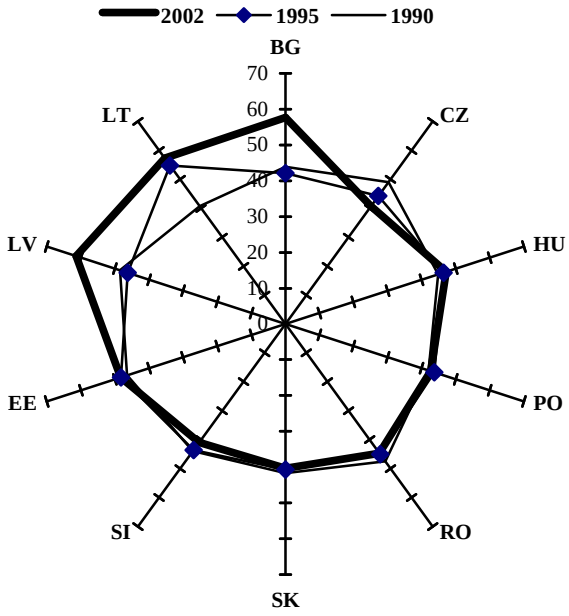
Note: Production values in the year 2002 converted with current exchange rates (ER), resp. purchasing power parities (PPP) for 2002. NMS-10 comprise NMS-8 plus Bulgaria and Romania.

Source: wiiw estimates based on national statistics and Eurostat New Cronos.

Before turning out to issues of productivity catching-up let us recall a few additional stylized facts regarding NMS manufacturing. Generally, manufacturing industry production in the NMS is *more specialized* than in the EU-15 and thus potentially more vulnerable to various shocks (European Commission, 2003). In terms of employment, the NMS' specialization of manufacturing industry is somewhat less pronounced, though still rather high. Employment specialization measured by concentration ratios (CR3)[18] did not change much during the last decade (except in Bulgaria and Latvia where specialization increased – see Figure 7). The three biggest industries account for 40% (Czech Republic) to 60% (Latvia and Lithuania) of manufacturing employment, compared to fairly constant 44% over the last decade in EU-15 on average.[19]

Figure 7

Manufacturing employment concentration ratios (CR3) in NMS



Note: CR3 is the share of 3 biggest NACE 2-digit industries in total manufacturing employment.

Source: Own calculations based on wiiw Industrial Database.

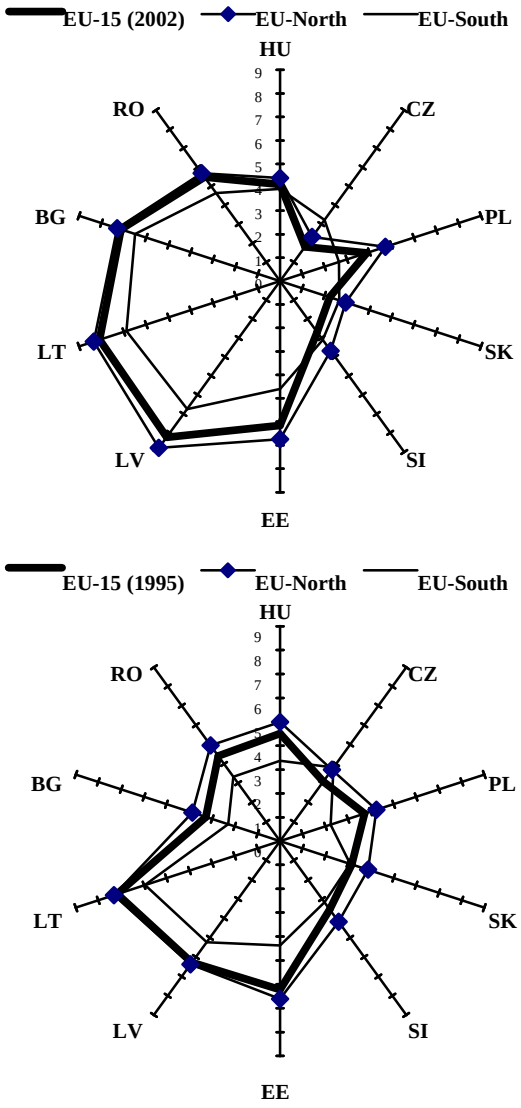
In terms of employment, the most important manufacturing branches in NMS are food and beverages, textiles, wood and wood products – see Table 3. The majority of Central and East European NMS have nowadays an industrial structure which is very close to that of EU-15. Manufacturing employment structure in the Czech Republic, Hungary, Slovakia and Slovenia came very close to that observed in EU-North by 2002. On the other hand,

[18] Concentration ratios are here defined as the share of 3 largest manufacturing branches in the total – CR3.

[19] However, in some 'old' EU member states is the employment concentration also rather high (e.g. 49% in Greece and even 55% in Ireland).

Figure 8

Deviations of NMS and EU-15 manufacturing employment structures, years 2002 and 1995[20]



Note: Structural deviations (S) are calculated from 2-digit NACE rev. 1 data for manufacturing employment. A lower value of 'S' indicates more structural similarity. For a definition see the following formula:

$$S^* = \sqrt{\sum_k (sh_k^{t_2} - sh_k^{t_1})^2 \cdot (sh_k^{t_1} / 100)}$$

k = individual industry

sh_k = share of industry k in total employment (in %)

t_i = country index, where i = 1,2; 1 denoting the EU.

Source: Own calculations based on wiiw Industrial Database and Eurostat.

[20] EU-South is defined as an average of Greece, Portugal and Spain, EU-North as an average of Germany, France and the United Kingdom.

employment structures in the Baltic states tend to be more distinct – in particular compared to EU-North. It is also interesting to note that in Bulgaria and Romania industrial employment structures increasingly deviate from that of EU-15 (and especially from EU-North), largely as a result of the collapse of machinery, electrical and transport equipment industries and rising shares of food, beverages and textiles (Figure 8).

Given the lack of comparable data for manufacturing employment in some NMS for earlier periods, this analysis will again focus on the period after 1995. Moreover, since detailed data on value added are not available for most NMS we use gross production instead. Between 1995 and 2002, manufacturing production in the NMS-8 rose on average much faster (6.4% per annum) than in the EU-15 (2.1% per annum – see Table 4). This translates into a growth differential in favour of the NMS of 4.3 percentage points per year, substantially higher than the growth differential for GDP during the same period (compare Chapter 1). On the other hand, manufacturing employment in the NMS declined strongly (-2.1% per annum) while it stayed more or less constant in the EU-15, resulting in a negative growth differential for the NMS-8 vis-à-vis the EU of -2.1 percentage points per annum, again significantly higher than for total employment. As a result, NMS' productivity catching-up, already impressive at the GDP level, was even more pronounced in manufacturing: between 1995 and 2002, the cumulated productivity gain in NMS' manufacturing industry amounted to 79%, compared to 16.4% for the EU-15 (Table 4). The annual growth differential was 6.5 percentage points, by far exceeding the growth differential in terms of macro-productivity. Maintaining this speed of catching-up would help to eliminate NMS' productivity gap in about ten years.

Table 4

Labour productivity catching-up in manufacturing: NMS vis-à-vis the EU-15, 1995-2002

	Growth rate in %		NMS' growth differential against EU-15 in pp			Growth rate in %	
	cumu-lated	annual average	cumu-lated	annual average		cumu-lated	annual average
NMS-8[1)]					**EU-15**		
Production	54.0	6.4	38.6	4.3	Production	15.4	2.1
Employment	-14.0	-2.1	-11.9	-2.1	Employment	-0.9	0.0
Productivity	79.1	8.7	62.7	6.5	Productivity	16.4	2.2

Notes: Gross production and productivity in real terms.-1) Central and East European New Member States, weighted average.

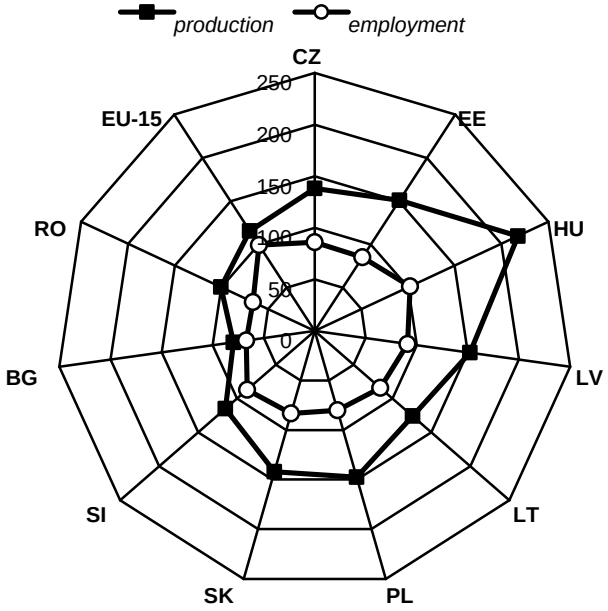
Sources: wiiw Database, incorporating national statistics, WIFO and wiiw calculations using AMECO.

Figure 9 shows indexes of production and employment for individual countries in the period 1995-2002 which indicate an impressive *productivity recovery* in most NMS. Hungary even managed to slightly increase the number of manufacturing jobs, in the remaining NMS productivity gains were associated with further lay-offs of workers. Hungary's outstanding

productivity performance in recent years thus resembles that of Ireland. Estonia, Poland and Slovakia outperformed Austria, Denmark and Finland, which have been the best performers in terms of labour productivity growth among the EU-15 (European Commission, 2003a). In several NMS and, as will be shown below, in a few manufacturing branches, there has been a spectacular productivity catching-up. But in contrast to the EU-15 where manufacturing employment has been stagnating, productivity catching-up in most NMS has been associated with considerable job losses. The new EU Member States will require specific growth and employment strategies (training, support of SMEs, regional policies for attracting FDI, etc.) to stabilize employment levels in manufacturing (and to create new employment opportunities in other sectors – especially services) while simultaneously maintaining the recent pace of productivity improvements.[21]

Figure 9

Manufacturing production and employment growth in NMS and EU-15, 2002 (1995=100)



Source: Own calculations based on wiiw Industrial Database and AMECO.

The NMS' productivity gaps for the whole economy discussed in Chapter 1 above are similar to those in the manufacturing industry – although their proper assessment poses considerable problems (see Appendix). On average, NMS' manufacturing labour productivity was only 30%-55% of that in EU-15 in the year 2002 (see also Figure 6b above). Table A1 provides several alternative estimates of manufacturing labour productivity levels (compared to EU-15 average) and their sectoral variation. Hungary's

[21] See also European Commission (2004), Celin (2003) for a more detailed discussion of employment strategies in the NMS.

productivity leadership in NMS' manufacturing (roughly half of the average productivity level in EU-15) is confirmed, Slovenia's productivity (about the same as in the Czech Republic) is surprisingly low given its relatively high per capita income. There are large productivity gaps among individual NMS and also the sectoral variation of labour productivity is relatively high, especially in Hungary, Slovakia and Slovenia (such comparisons are of course affected by varying capital intensity of individual industries and the use of intermediate inputs).

Contrary to the broader sectoral developments shown above (Figure 6), a comparison of productivity changes across individual manufacturing branches displays a quite clear pattern: The most obvious 'productivity winner' in the 1995-2002 period was the electrical & optical equipment industry, performing much above average in all NMS, followed by the transport equipment industry and manufacturing n.e.c. (mainly furniture – see Table A2). Note that all these branches were attractive targets for FDI. In the Baltic states, non-metallic mineral products and basic metals are clear productivity winners as well. Typical 'productivity losers' are the food & beverages industry, textiles & textile products, leather & leather products, paper & printing, chemicals and rubber and plastics. The poor productivity performance of food industry is both surprising and disturbing: this industry received large amounts of FDI, it also ranks among biggest employers in most NMS. In general, we find certain evidence that technologically more sophisticated industries have strongly improved their productivity performance, while traditional sectors using standard techniques and low skilled labour have been falling behind.[22]

5 Productivity and employment growth dilemmas

The productivity growth recorded in most NMS in the period after 1995 has been associated with only meagre increases of employment (in manufacturing industry even with considerable job losses – here with the exception of Hungary). In the context of EU Lisbon Strategy which aims at both improved competitiveness and high employment growth, the NMS thus face an even greater challenge than the EU-15 Member States. Focusing on both targets simultaneously (i.e. fast productivity growth and employment growth) may be conflicting.[23] Taking into account that NMS are confronted with a situation of low productivity levels (about half of the EU-15 average – see above) and, at the same time of high unemployment (on average nearly twice the EU-15 level), they need to foster both productivity and employment growth simultaneously. Realistically, the main accent of

[22] Using a different classification, van Ark and Piatkowski (2004) found that the largest contribution to aggregate labour productivity growth in selected NMS (the Czech Republic, Hungary, Poland and Slovakia) during the period 1993-2001 originated not from ICT-producing manufacturing, but rather from ICT-using and non-ICT manufacturing branches.

[23] Policies aiming at higher employment may have negative consequences for labour productivity growth at least in the short run – see O'Mahony and van Ark et al., 2003.

economic policies in these countries should focus on at least keeping existing jobs while simultaneously maintaining the recent pace of productivity catching-up.

This is a formidable task: the relation between employment and production growth (employment elasticity to output growth – see Employment in Europe, 2002) in the NMS has been rather disappointing since even in the recent period of relatively robust economic growth (that is after 1995) there has been little effect on the job creation; the employment elasticity to GDP growth has been much below unity. This is illustrated in Figure 10 where indexes of GDP and employment growth (and the respective trend lines for the period 1992-2003) are plotted for three NMS. There are differences between individual countries: a constant employment would require GDP growth of at least 3% in Hungary, yet more than 4% in the Czech Republic and about 6% in Poland (the latter two countries could enjoy such rates of GDP growth only twice during the last decade).

Regression estimates covering a sample of all NMS-8 (that is without Bulgaria and Romania) for the time period 1995-2003 show that the average *critical rate* of GDP growth which would prevent further employment decline in the NMS has been nearly 6% per year in the period 1995-2003, which is again much more than the GDP growth actually achieved during that period (Table 5, see also Table 1 above).[24] For the manufacturing industry, the same estimation method yields even more disturbing results: the *critical rate* of production growth is here more than 10% per year,[25] nearly twice as high as the average manufacturing growth rate actually achieved during the (high growth) period of 1995-2003 (Table 4). Seen from this angle, and taking into account the expected rates of economic growth and NMS evolving economic structures, the prospects for rising employment outside of services are not very encouraging. Without a substantial acceleration of their economic growth and/or a significant job creation in the services sector, the NMS seem to be condemned either to remain substantially less productive than EU-15 Member States, or to face the challenge of an even higher unemployment in the future.[26]

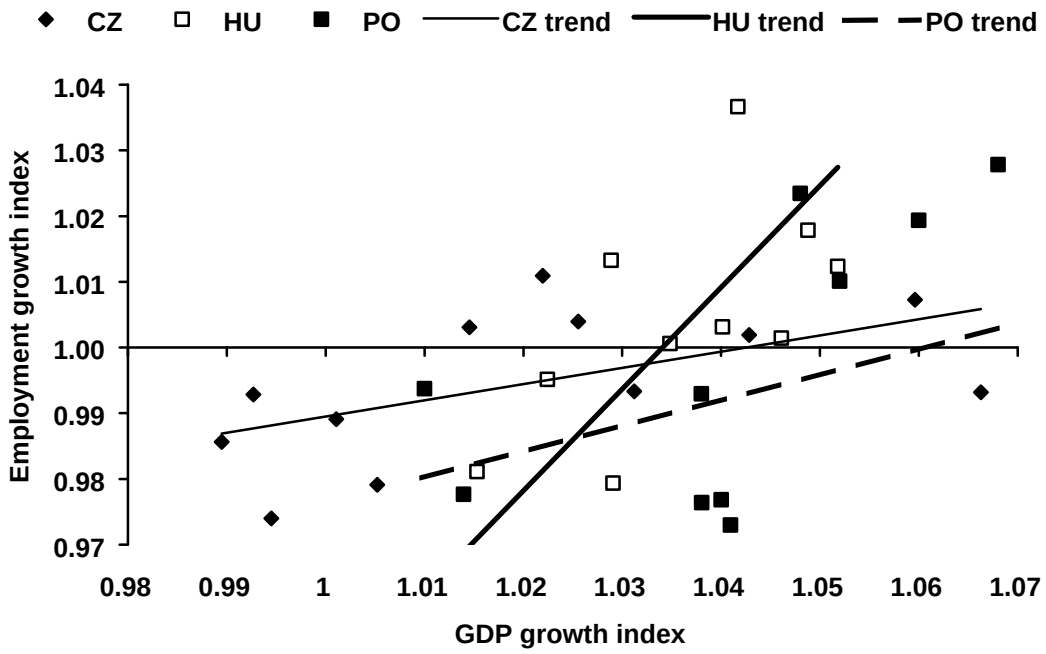
[24] This compares with a critical GDP growth rate of just 0.5% estimated for the same period for the EU, USA and Japan, resp. 1.3% GDP growth estimated for these countries for the period 1992-2002. As shown in Figure 10, there are differences in estimated critical growth rates among individual NMS. However, regression estimates with country-specific dummies did not yield statistically significant parameters.

[25] Compared to 3.2% production growth estimated for the EU, USA and Japan for the same period.

[26] During the last couple of years, the only sectors where additional jobs were created in the NMS are trade, hotels and restaurants, real estate, public administration and other activities – see Landesmann et al (2004) for more details.

Figure 10

Employment elasticity of GDP growth in selected NMS, 1992-2003



Source: wiiw calculations from wiiw Database based on national statistics.

Table 5

Regression estimates of NMS employment elasticity to GDP growth, 1995-2003

Part A: Employment (yEMP) and GDP growth (xGDP)

```
      Source |       SS       df       MS              Number of obs =      72
-------------+------------------------------           F(  1,    70) =    7.46
       Model |  .005117734     1  .005117734           Prob > F      =  0.0080
    Residual |  .047996241    70  .000685661           R-squared     =  0.0964
-------------+------------------------------           Adj R-squared =  0.0834
       Total |  .053113975    71  .000748084           Root MSE      =  .02619

------------------------------------------------------------------------------
        yEMP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        xGDP |   .2837031   .1038436     2.73   0.008     .0765935    .4908126
       _cons |   .6998083   .1086923     6.44   0.000     .4830283    .9165884
```

Note: The estimated regression equation was:

yEMP = const + b*xGDP

where:
yEMP: index of employment growth,
xGDP: index of GDP growth.

Min. estimated GDP growth index (critical growth rate)needed for employment staying at least constant (yEMP = 1) is thus: ((1-cons)/xGDP) = 1.058.

Part B: Manufacturing employment (yEMP) and output growth (xOUT)

```
      Source |       SS       df       MS              Number of obs =      72
-------------+------------------------------           F(  1,    70) =   32.90
       Model |  .029368643     1  .029368643           Prob > F      =  0.0000
    Residual |  .062485798    70  .000892654           R-squared     =  0.3197
-------------+------------------------------           Adj R-squared =  0.3100
       Total |  .091854441    71  .001293725           Root MSE      =  .02988

------------------------------------------------------------------------------
        yEMP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        yOUT |     .34488   .0601267     5.74   0.000      .224961     .464799
       _cons |   .6179655   .0638732     9.67   0.000     .4905744    .7453566
```

Min. estimated manufacturing output growth index (critical growth rate) needed for manufacturing employment staying at least constant (yEMP = 1) is thus: ((1-cons)/xOUT) = 1.108.

Source: Own calculations, wiiw Database.

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Appendix

Labour productivity in international comparison

International productivity level comparisons are hampered mainly by the difficult conversion of the national output data to a common currency unit (in the services sector even by the proper measurement of national output – see Wölfl, 2004). The use of market exchange rates is not appropriate for the conversion to common currency units (especially for NMS, mainly due to their still grossly undervalued currencies and fluctuating exchange rates). Alternative proxy converters are either purchasing power parities (PPPs), or – much better – branch-specific unit value ratios (UVR) which compare prices of representative industrial products. UVR estimates for the manufacturing industry (for the year 1996) are available only for 3 NMS: the Czech Republic, Hungary and Poland relative to Germany from a research project jointly conducted by the wiiw and the University of Groningen.[27] The estimated Hungarian manufacturing industry labour productivity was slightly less than 40% of the German level in 1996, the respective Czech-German productivity relation was 35%, the Polish-German productivity relation was 25%, all with fairly large sectoral differences. Figure A1 shows productivity comparisons of these 3 NMS with Austria; the year 2002 was obtained after extrapolation from the above quoted 1996 UVR-based benchmarks with country and branch-specific rates of productivity growth.

The results show that Hungarian manufacturing productivity reached close to half of Austrian level by the year 2002; there was a closure of productivity gap by nearly 10 percentage points since 1996. In Poland, the closure of the gap was even faster, whereas the productivity gap of the Czech manufacturing relative to Austria declined by less than 2 percentage points. A closer look at the performance of individual branches shows that relatively smaller productivity gaps (and impressive productivity catching-up) were observed especially in manufacturing of rubber and plastics, electrical, optical equipment and transport equipment, but virtually no catching-up occurred in other branches. Hungary's labour productivity in transport equipment industry, Polish productivity in rubber and plastics were apparently higher than in Austria. On the other hand, productivity gaps in food & beverages, leather and wood products have even widened since 1996.

For a cross-country comparison, data in national currencies were converted with both exchange rates (ER) and purchasing power parities (PPPs). PPPs were adopted from the ECP 1999 – see Eurostat (2001). The first data set presented in Table A1 (PPP for GDP) results from national productivity figures converted with purchasing power parities for the whole GDP. This conversion leads to higher productivity estimates for the NMS. The second data set uses as a conversion factor partial PPPs for gross fixed capital formation

[27] See Monnikhof and van Ark (2002).

(PPPCAP) where the price levels in the NMS are relatively high (presumably due to imports of machinery and equipment). This conversion thus leads to lower productivity estimates. Given the close correspondence of the latter productivity estimates to the theoretically superior UVR-based productivity data for the Czech Republic, Hungary and Poland (UVRs are not available for other NMS), and assuming that a similar correspondence between UVR and PPPCAP exists for other NMS as well, one can assume that productivity levels expressed at PPPCAP in Table A1 are probably closer to reality – at least for manufacturing industry as a whole.

Table A1

Labour productivity levels in NMS manufacturing industry, year 2002

		Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Slovak Republic	Slovenia	Bulgaria	Romania
			2001		2001	2001					
	Manufacturing total, productivity in EUR (at PPP for GDP)	113201	51870	127305	45277	56747	93842	102425	77714	43720	52978
	EU(15) = 100	67.6	31.0	76.0	27.0	33.9	56.0	61.2	46.4	26.1	31.6
	Manufacturing total, productivity in EUR (at PPPCAP)	77543	33078	86977	25977	32276	68945	69504	71070	32743	38257
	EU(15) = 100	46.3	19.8	51.9	15.5	19.3	41.2	41.5	42.4	19.6	22.8
	Manufacturing total, productivity in EUR (at ER)	44722	24478	54945	18359	21967	42032	39651	54652	12655	15859
	EU(15) = 100	26.7	14.6	32.8	11.0	13.1	25.1	23.7	32.6	7.6	9.5
	Manufacturing total = 100										
DA	Food products; beverages and tobacco	127.1	132.6	81.9	126.4	108.9	115.3	103.2	157.7	123.1	203.9
DB	Textiles and textile products	46.9	62.9	25.8	54.0	63.3	37.7	23.8	44.0	35.5	35.6
DC	Leather and leather products	23.0	58.0	18.8	39.3	88.4	44.6	30.6	37.4	34.2	27.3
DD	Wood and wood products	102.9	114.1	45.2	101.1	76.6	77.7	46.2	56.8	89.1	71.3
DE	Pulp, paper & paper products; publishing & printing	114.5	145.3	79.4	105.2	98.1	127.7	124.5	104.7	96.7	107.2
DF	Coke, refined petroleum products & nuclear fuel	1045.2	.	269.4	.	983.0	495.9	633.4	33.8	864.1	862.8
DG	Chemicals, chemical products and man-made fibres	160.4	161.7	132.0	95.6	224.1	163.7	132.8	217.8	176.0	182.8
DH	Rubber and plastic products	106.5	115.4	82.1	160.0	147.5	108.5	107.6	82.6	72.9	107.7
DI	Other non-metallic mineral products	89.2	124.1	71.0	129.1	65.9	91.7	67.6	89.0	131.5	71.5
DJ	Basic metals and fabricated metal products	83.5	92.6	74.9	78.9	69.7	98.4	106.2	79.4	162.3	196.2
DK	Machinery and equipment n.e.c.	73.7	101.6	71.7	73.8	52.2	69.7	70.7	121.7	65.5	56.4
DL	Electrical and optical equipment	96.8	64.7	167.3	113.1	113.9	113.0	70.9	78.9	109.8	62.6
DM	Manufacture of transport equipment	153.2	138.4	260.5	71.0	83.5	130.1	282.2	241.1	70.1	67.0
DN	Manufacturing n.e.c.	73.1	63.6	42.7	78.1	57.2	74.5	83.1	79.4	56.7	57.0
	Others				210.3						
	Standard deviation	247.0	33.7	76.4	42.8	232.5	108.0	151.0	61.3	202.6	205.3
	Standard deviation (without DF)	37.1	33.7	62.9	42.8	44.9	34.1	62.8	60.5	43.1	58.2

Sources: wiiw estimates based on national statistics, OECD, EUROSTAT and UNIDO.

Table A2

Relative productivity gains in NMS manufacturing, 1995-2002

(average annual change in % for total manufacturing (D) and relative gains DA to DN, in percentage points) [1)]

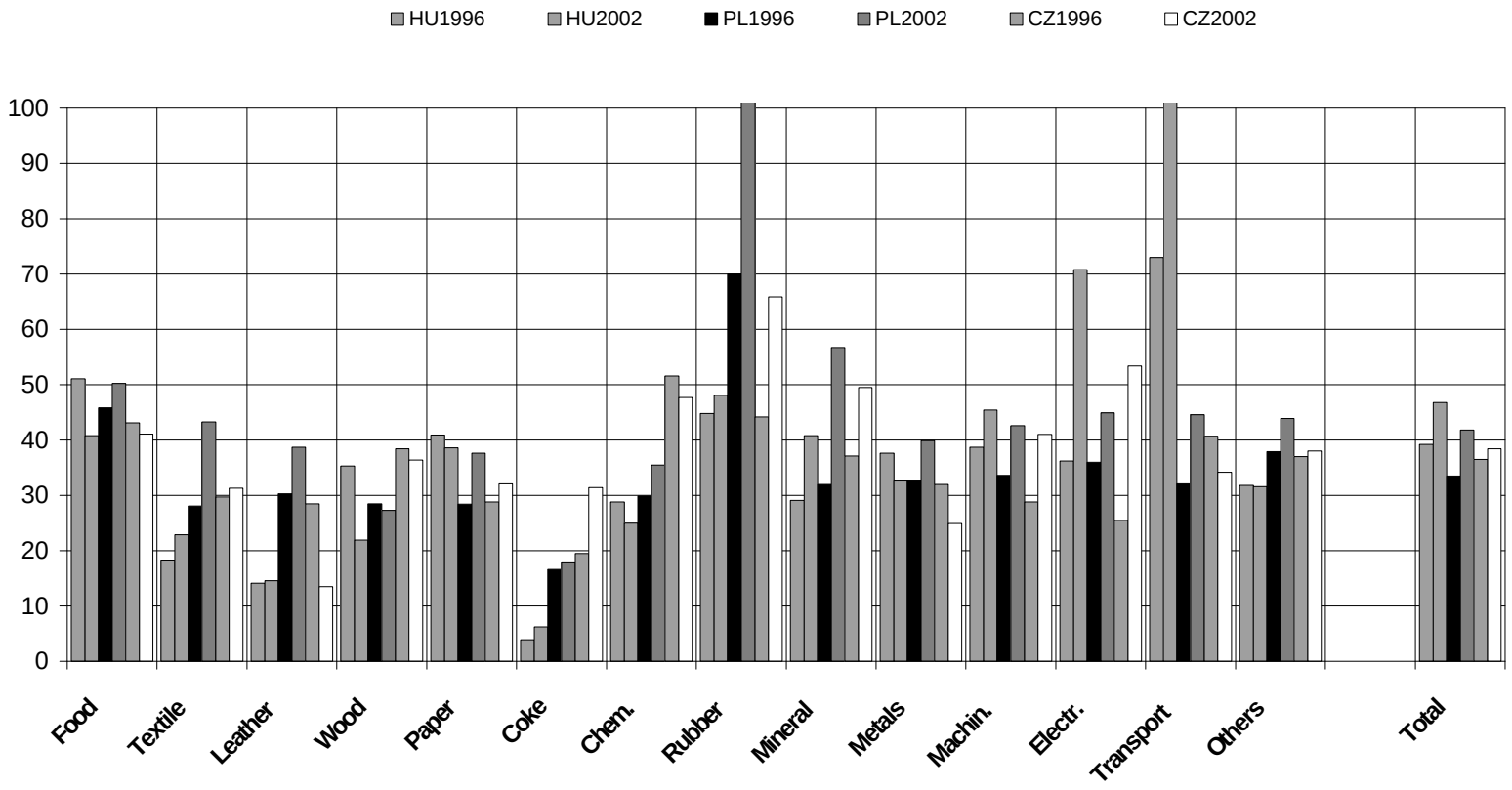
		Czech Republic	Estonia[2)]	Hungary	Latvia[2)]	Lithuania[2)]	Poland	Slovak Republic	Slovenia	Bulgaria	Romania
D	**Manufacturing total**	**4.0**	**10.3**	**8.0**	**7.5**	**7.0**	**9.3**	**8.0**	**3.0**	**-1.1**	**5.3**
DA	Food products; beverages and tobacco	-4.9	-5.5	-6.8	-4.8	-3.9	-3.4	-3.4	-0.4	-4.5	5.6
DB	Textiles and textile products	-3.5	0.8	-2.5	0.4	-2.0	-0.7	-7.9	-1.0	-1.5	-2.7
DC	Leather and leather products	-14.8	0.4	-6.6	-2.2	6.9	-1.8	-0.8	-7.3	-3.8	-4.3
DD	Wood and wood products	-5.3	12.8	-6.2	-2.0	2.2	-1.3	-4.5	-6.5	4.9	-2.4
DE	Pulp, paper & paper products; publishing & printing	-1.0	0.5	-4.7	-0.6	-4.0	-0.9	1.9	-5.5	-2.0	-14.0
DF	Coke, refined petroleum products & nuclear fuel	19.5		-1.7	-7.5	-4.2	-7.0	-2.3	-35.1	0.8	2.3
DG	Chemicals, chemical products and man-made fibres	2.6	3.8	-4.9	-4.2	6.0	0.1	-1.1	2.7	0.5	-0.6
DH	Rubber and plastic products	-0.5	-0.7	-5.6	10.2	0.4	0.4	-2.7	-2.7	-0.8	-5.1
DI	Other non-metallic mineral products	-1.7	3.2	-1.6	11.2	0.9	1.8	-3.0	1.8	5.6	-0.9
DJ	Basic metals and fabricated metal products	-5.1	4.1	-4.8	3.3	-2.8	-1.4	-5.6	-1.5	5.3	3.0
DK	Machinery and equipment n.e.c.	5.7	8.0	-0.8	-5.3	0.9	1.4	1.8	-0.1	5.0	4.2
DL	Electrical and optical equipment	13.0	1.9	13.9	18.1	12.3	3.8	2.8	2.8	9.2	-0.1
DM	Transport equipment	3.4	8.7	7.4	-2.4	12.4	4.9	15.6	6.0	5.7	5.9
DN	Manufacturing n.e.c.	1.7	0.3	-2.9	6.9	-4.5	0.8	2.0	1.7	1.8	7.3

Notes: 1) Calculation of relative gains: DA (1995-2002) minus D (1995-2002) = relative gain DA. Positive values indicate higher, negative values lower than average productivity growth relative to total manufacturing (D). - 2) 1995-2001.

Sources: wiiw estimates based on national statistics; wiiw Industrial Database.

Figure A1

Manufacturing labour productivity in selected NMS (UVR-based), years 1996 and 2002 (Austria = 100)



Source: wiiw Industrial Database, own estimates based on Monnikhof and van Ark (2002).

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